additive ecological effect of multiple pesticide exposures. Studies also are needed to verify that higher trophic levels are not affected by decreased invertebrate production. This work should emphasize potential impacts on threatened and endangered fish species.

The Integration Panel for the CALFED Ecosystem Restoration Program has set aside $1.5 million for follow-up work to determine the ecological significance of the pesticide toxicity events. Furthermore, the Integration Panel asked the Contaminant Effects Interagency Environmental Program Work Team to recommend follow-up studies.

Biological surveys and ecological assessments will be conducted through the CALFED Ecosystem Restoration Program in coordination with the Water Quality Program.

It is proposed that CALFED support the efforts of DPR and the RWQCB to monitor surface water in the Sacramento and San Joaquin River watersheds. Monitoring will help to determine compliance with applicable water quality objectives and establish a database useful in developing TMDLs and other regulatory tools necessary to achieve compliance. This monitoring portion, as well as some studies, may be incorporated into the CMARP.

5.5.3 Existing Activities

Both DPR and the SWRCB/RWQCBs have statutory responsibilities for protecting water quality from the adverse effects of pesticides. In 1997, DPR and the SWRCB signed an MAA, clarifying these responsibilities. In a companion document, "Pesticide Management Plan for Water Quality," a process was outlined for protecting beneficial uses of surface water from the potential adverse effects of pesticides. The process relies on a four-stage approach.

The "Pesticide Management Plan for Water Quality" outlines a process for protecting beneficial uses of surface water from the potential adverse effects of pesticides. The process relies on a four-stage approach.

- Stage 1 relies on education and outreach efforts to communicate pollution prevention strategies.
- Stage 2 efforts involve self-regulating or cooperative efforts to identify and implement the most appropriate site-specific reduced-risk practices.
- Stage 3 achieves mandatory compliance through restricted-use pesticide permit requirements, implementation of regulations, or other DPR regulatory authority.

- Stage 4 achieves mandatory compliance through the WQCPs of the SWRCB and RWQCB or other appropriate regulatory measures consistent with applicable authorities.

Currently, DPR is coordinating a Stage 2 effort to address the effects of dormant sprays on surface water. DPR's stated goal is to eliminate the toxicity associated with dormant spray insecticides (i.e., chlorpyrifos, diazinon, and methidathion) in the Sacramento and San Joaquin River Basins and the Delta. CALFED is granting funds to UC Davis for the development of BMPs for various uses of pesticides. As long as progress continues toward compliance with appropriate water quality objectives, Stage 3 activities will be unnecessary.

In January 1999, the CVRWQCB approved a TMDL schedule for diazinon for the Lower Sacramento River and the Lower Feather River. The TMDL report for these rivers is scheduled for completion in June 2002, and the Basin Plan Amendment is scheduled for completion in June 2003. Also during January 1999, the CVRWQCB approved a TMDL schedule for the San Joaquin River and the Delta for both diazinon and chlorpyrifos. The TMDL schedule for the San Joaquin River includes a TMDL report by June 2002 and a Basin Plan Amendment in June 2003. The TMDL schedule for the Delta includes a TMDL report by June 2003 and a Basin Plan Amendment in June 2004. Components of a TMDL include problem description, numeric targets, monitoring and source analysis, implementation plan, load allocations, performance measures and feedback, margin of safety and seasonal variation, and public participation. It should be noted that if monitoring demonstrates that the waterways are in compliance with the numeric target, no further action is required.

Components of a TMDL include problem description, numeric targets, monitoring and source analysis, implementation plan, load allocations, performance measures and feedback, margin of safety and seasonal variation, and public participation.

Several activities are underway in the Sacramento-San Joaquin River Basin to develop agricultural BMPs in order to control orchard dormant spray runoff. These are summarized below according to the agency conducting the study.

Department of Pesticide Regulation

In addition to the activities already discussed, DPR is investigating orchard floor management as a means to reduce discharges of dormant sprays into surface waterways. At an experimental plot at UC Davis, DPR staff measured discharges of chlorpyrifos, diazinon, and methidathion from a peach orchard with three orchard floor treatments. Investigations are continuing in a commercial orchard. At the California State University at Fresno, DPR is investigating the effects of microbial augmentation and post-application tillage on runoff of dormant sprays. Results will be highlighted in DPR's own outreach activities and will be made available to other groups interested in the identification and promotion of reduced-risk MPs.

DPR also is monitoring water quality at four sites—two each within the Sacramento and San Joaquin River watersheds. During the dormant spray use season, approximately January through mid-March, water samples are collected five times each week from each site. Chemical analyses are performed on each sample; one chronic and two acute toxicity tests, using *Ceriodaphnia dubia*, are performed each week.

Novartis

The Registrant of diazinon distributed over 10 thousand brochures last winter through UC Extension, county agricultural commissioner's offices, and pesticide distributors. The brochure described the water quality problems associated with dormant spray insecticides and recommended a voluntary set of BMPs to help protect surface waters. Novartis intends to repeat the education and outreach program this winter.

Urban Pesticide Committee

The UPC has extensive experience in urban pesticide management and has completed reports on monitoring and source identification. The UPC also has drafted a Public Education and Outreach Plan. It is a stakeholder-driven and supported program that is poised to make significant strides in reducing discharges of urban pesticides.

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City of Sacramento and County of Sacramento

Under the Stormwater Management Program, the City of Sacramento and County of Sacramento have conducted monitoring and special studies to reduce urban pesticide impacts on local waterways.

Dow Agro Sciences and Novartis

Dow Agro Sciences and Novartis, the registrants of chlorpyrifos and diazinon, have undertaken a multi-year study in Orestimba Creek in the San Joaquin River Basin, with the primary objective of identifying specific agricultural use practices involved in chemical movement offsite into surface water. The study involves an evaluation of pesticide movement in both winter storms and in summer irrigation return water flows. Objectives in subsequent years include using the data to develop and field test management practices in order to reduce off-site chemical movement. The first-year and second dormant-season monitoring are completed. Two reports are now available, and an ACS Symposium Series book chapter is in press. Follow-up field-scale evaluations of irrigation management practices were conducted, and a report of non-replicated comparisons with standard practices is available.

Biologically Integrated Orchard Systems

The BIOS Program pioneered community-based efforts to implement economically viable, nonconventional pest MPs. The program emphasizes management of almond orchards in Merced and Stanislaus Counties to minimize or eliminate the use of dormant spray insecticides. BIOS received a DPR pest management grant and a CWA Section 319(h) non-point source implementation grant. BIOS also received funding from CALFED.

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Biorational Cling Peach Orchard Systems

The Biorational Cling Peach Orchard Systems (BCPOS) Program has the same goals as the BIPS Program, except that it focuses on primary pests in cling peach orchards. The UC Cooperative Extension is acting as project leader, with Sacramento and San Joaquin Valley coordinators. BCPOS received a DPR pest management grant.

The BCPOS Program has the same goals as the BIPS Program, except that it focuses on primary pests in cling peach orchards

Colusa County Resource Conservation District

The Colusa County Resource Conservation District (RCD) is leading a runoff management project in the watershed of Hahn Creek. Project participants are identifying MPs that reduce runoff from almond orchards in the watershed, thereby reducing pesticide loads in the creek. Outreach and demonstration sites are part of this project. This project received a CWA Section 319(h) grant.

Glenn County Department of Agriculture

The Glenn County Department of Agriculture is organizing local growers and pest control advisors (PCAs) to address the use of dormant spray insecticides in the county. The local RCD also is involved; they are applying for grants to facilitate the implementation of reduced-risk pest MPs.

Natural Resources Conservation Service - Colusa Office

The Colusa County office of the Natural Resources Conservation Service (NRCS) recently was awarded over $100,000 from the Environmental Quality Incentives Program (EQIP), one of the conservation programs administered by the U.S. Department of Agriculture (USDA). EQIP offers contracts that provide incentive payments and cost sharing for conservation practices needed at each site. Most of these funds should be available to help implement reduced-risk pest MPs in almond orchards in the area.

Natural Resources Conservation Service - Stanislaus Office

The Stanislaus County office of NRCS recently was awarded $700,000 from EQIP. Half of the funds are allocated to address livestock production practices, but most of the remaining funds should be available to address dormant sprays and the implementation of reduced-risk pest MPs. Local work groups, comprised of RCDs, NRCS, the Farm Services Agency, county agricultural commissioners, the Farm Bureau, and others, will determine how EQIP funds will be distributed. Applicants for EQIP funds will be evaluated on their ability to provide the most environmental benefits.

The Nature Conservancy

The Nature Conservancy is enrolling more prune growers in the BIPS project as it proceeds with its Phelan Island restoration project in the Sacramento Valley. This project received a CWA Section 319(h) grant.

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UC Statewide Integrated Pest Management Project

In late 1997, the UC Statewide Integrated Pest Management (UCIPM) Project was awarded a 2-year grant by the SWRCB to: (1) identify alternate orchard MPs to prevent or reduce off-site movement of dormant sprays, (2) provide outreach and education on these new practices to the agricultural community, and (3) design and initiate a monitoring program to assess the success of the new practices. A steering committee, composed of representatives from community groups, state agencies including CVRWQCB staff, and UC academicians, was formed to serve as a peer review body for the study. UCIPM received CALFED funding.